Claims

1. A method for identifying a nucleic acid molecule encoding a polypeptide that regulates lipid accumulation, said method comprising:

(a) providing a mutagenized nematode having a pre-existing mutation in a nucleic acid molecule selected from the group consisting of *kat-1, kat-2, bbs-1, egl-4, ald-1, che-2, daf-6, C29E6.4, osm-5, tax-2,* and *tax-4*;

(b) contacting said nematode with a dye that stains body fat; and

(c) comparing the body fat staining of said mutagenized nematode to a control nematode, wherein a mutation in a nucleic acid molecule encoding a polypeptide that regulates lipid accumulation is identified by an alteration in body fat staining.

2. A method for identifying a nucleic acid molecule that encodes a polypeptide that regulates lipid accumulation, said method comprising:

(a) contacting a nematode having a pre-existing mutation in a nucleic acid molecule selected from the group consisting of *kat-1, kat-2, bbs-1, egl-4, ald-1, che-2, daf-6, C29E6.4, osm-5, tax-2,* and *tax-4* with a candidate inhibitory nucleic acid;

(b) contacting said nematode with a dye that stains body fat; and

(c) comparing the body fat staining of said nematode contacted with said inhibitory nucleic acid molecule to a control nematode, wherein an alteration in body fat staining identifies the sense nucleic acid molecule corresponding to said inhibitory nucleic acid molecule as a nucleic acid molecule encoding a polypeptide that regulates lipid accumulation.

3. A method for identifying a candidate compound that modulates lipid accumulation, said method comprising:

(a) providing a cell expressing at least one nucleic acid molecule selected from the group consisting of *kat-1, kat-2, egl-4, ald-1, che-2, daf-6, osm-5, C29E6.4, tax-2,* and *tax-4*;

(b) contacting said cell with a candidate compound; and

(c) comparing the expression of said nucleic acid molecule in said cell contacted with said candidate compound with the expression of said nucleic acid molecule in a control cell, wherein an alteration in said expression identifies said candidate compound as a candidate compound that modulates lipid accumulation.

4. The method of claim 3, wherein said cell is a nematode cell.

5. The method of claim 3, wherein said cell is a mammalian cell.

6. The method of claim 3, wherein said cell comprises at least two nucleic acid molecules comprising mutations.

7. A method for identifying a candidate compound that modulates lipid accumulation, said method comprising:

(a) providing a nematode cell expressing at least one nucleic acid molecule selected from the group consisting of *kat-1, kat-2, bbs-1, egl-4, ald-1, che-2, daf-6, osm-5, C29E6.4, tax-2,* and *tax-4*;

(b) contacting said cell with a candidate compound; and

(c) comparing the expression of said nucleic acid molecule in said cell contacted with said candidate compound with the expression of said nucleic acid molecule in a control cell, wherein an alteration in said expression identifies said candidate compound as a candidate compound that modulates lipid accumulation.

8. The method of claim 7, wherein said screening method identifies a compound that increases or decreases transcription of said nucleic acid molecule.

9. The method of claim 7, wherein said screening method identifies a compound that increases or decreases translation of an mRNA transcribed from said nucleic acid molecule.

10. The method of claim 7, wherein said cell is in a nematode.

11. The method of claim 7, wherein said cell comprises at least two nucleic acid molecules comprising mutations.

12. A method for identifying a candidate compound that regulates lipid accumulation, said method comprising:

(a) providing a cell expressing a polypeptide selected from the group consisting of KAT-1, KAT-2, EGL-4, ALD-1, CHE-2, DAF-6, OSM-5, C29E6.4, TAX-2, and TAX-4;

(b) contacting said cell with a candidate compound; and

(c) comparing the biological activity of said polypeptide in said cell contacted with said candidate compound to a control cell, wherein an alteration in said biological activity of said polypeptide identifies said candidate compound as a candidate compound that modulates lipid accumulation.

13. The method of claim 12, wherein said cell is a nematode cell.

14. The method of claim 13, wherein said nematode cell is in a nematode.

15. The method of claim 12, wherein said cell is a mammalian cell.

16. The method of claim 12, wherein said biological activity is monitored with an enzymatic assay.

17. The method of claim 12, wherein said biological activity is monitored with an immunological assay.

18. The method of claim 12, wherein said biological activity is monitored by detecting fat levels.

19. A method for identifying a candidate compound that modulates lipid accumulation, said method comprising the steps of

a) contacting a polypeptide selected from the group consisting of KAT-1, KAT-2, EGL-4, ALD-1, CHE-2, DAF-6, OSM-5, C29E6.4, TAX-2, and TAX-4, or a fragment thereof, or an ortholog thereof, with a candidate compound; and

b) detecting binding of said candidate compound to said polypeptide, wherein said binding identifies the candidate compound as a compound that modulates lipid accumulation.

20. A transgenic organism overexpressing a *kat-1, kat-2, egl-4* gain-of-function, *bbs-1, C29E6.4*, or *ald-1* nucleic acid molecule, or fragment thereof, wherein expression of the protein product encoded by said nucleic acid molecule alters lipid accumulation in said organism.

21. The transgenic organism of claim 20, wherein said organism is a nematode.

22. The transgenic organism of claim 20, wherein said organism is a rodent and said polypeptide is an ortholog of KAT-1, KAT-2, C29E6.4, or EGL-4 gain-of-function.

23. A nematode comprising a mutation in a nucleic acid sequence selected from the group consisting of *kat-1, kat-2, egl-4* gain-of-function, *ald-1,* C29E6.4, and *bbs-1.*

24. A mammal comprising at least one mutation in a nucleic acid sequence selected from the group consisting of *kat-1, che-2, daf-6, osm-5, C29E6.4, tax-2, tax-4* or *egl-4* gain-of-function.

25. A double-stranded RNA corresponding to at least a portion of a nucleic acid molecule selected from the group consisting of *kat-1, kat-2, egl-4, ald-1, che-2, daf-6, osm-5, C29E6.4, tax-2,* and *tax-4*, or an ortholog thereof, wherein said double-stranded RNA when introduced to a cell is capable of altering the level of lipid accumulation in said cell.

26. An antisense nucleic acid molecule complementary to at least a portion of a nucleic acid molecule selected from the group consisting of *kat-1, kat-2, egl-4, ald-1, che-2, daf-6, osm-5, C29E6.4, tax-2,* and *tax-4*, or an ortholog thereof, wherein said antisense nucleic acid molecule when introduced to a cell is capable of decreasing expression from the nucleic acid molecule to which it is complementary.

27. A method for diagnosing an organism having, or having a propensity to develop a lipid accumulation disorder, obesity, or an obesity-related disease, said method comprising detecting an alteration in the sequence of a nucleic acid molecule selected from the group consisting of *kat-1, kat-2, C29E6.4, egl-4, ald-1, che-2, daf-6, osm-5, tax-2,* and *tax-4,* or an ortholog thereof.

28. A method for diagnosing an organism having, or having a propensity to develop, a lipid accumulation disorder, obesity, or an obesity-related disease, said method comprising detecting an alteration in the expression of a nucleic acid molecule selected from the group consisting of *kat-1, kat-2, egl-4, ald-1, che-2, daf-6, osm-5, C29E6.4, tax-2,* and *tax-4,* or an ortholog thereof, relative to the wild-type level of expression.

29. A method for diagnosing an organism having, or having a propensity to develop, a lipid accumulation disorder, obesity, or an obesity-related disease, said method comprising detecting an alteration in the biological activity of a polypeptide selected from the group consisting of KAT-1, KAT-2, EGL-4, ALD-1, CHE-2, DAF-6, OSM-5, C29E6.4, TAX-2, and TAX-4, or an ortholog thereof, relative to the wild-type level of activity.

30. A method for modulating lipid accumulation in an organism, said method comprising contacting said organism with an antisense nucleic acid molecule that complements a portion of a nucleic acid molecule selected from the group consisting of *kat-1, kat-2, egl-4, ald-1, che-2, daf-6, osm-5, C29E6.4, tax-2,* and *tax-4,* or an ortholog thereof.

31. A method for modulating lipid accumulation in an organism, said method comprising contacting said organism with a dsRNA nucleic acid molecule that corresponds to at least a portion of a nucleic acid molecule selected from the group consisting of *kat-1, kat-2, egl-4, ald-1, che-2, daf-6, osm-5, C29E6.4, tax-2,* and *tax-4,* or an ortholog thereof.

32. A method for modulating lipid accumulation in an organism, said method comprising contacting said organism with a nucleic acid molecule selected from the group consisting of *kat-1, kat-2, egl-4, ald-1, che-2, daf-6, osm-5, C29E6.4, tax-2,* and *tax-4,* or an ortholog thereof.

33. The method of claim 30, 31, or 32, wherein said organism is a mammal.

34. The method of claim 33, wherein said mammal is a human.

35. A pharmaceutical composition comprising a polypeptide, or portion thereof, selected from the group consisting of mammalian orthologs of KAT-1, KAT-2, EGL-4, ALD-1, CHE-2, DAF-6, OSM-5, C29E6.4, TAX-2, and TAX-4.

36. A pharmaceutical composition comprising a nucleic acid molecule or portion thereof, selected from the group consisting of mammalian orthologs of *kat-1, kat-2, egl-4, ald-1, che-2, daf-6, osm-5, C29E6.4, tax-2,* and *tax-4*.